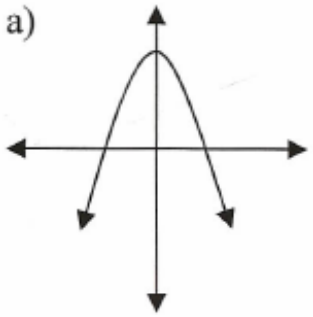
Math 11

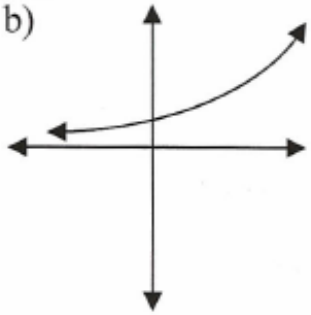
Rate of Change – Review #1

1. Which of the following graphs has a **constant** rate of change?

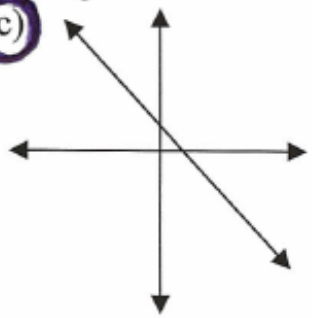
a)



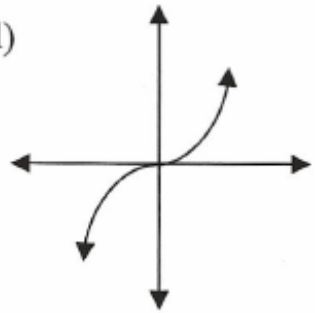
b)



c)

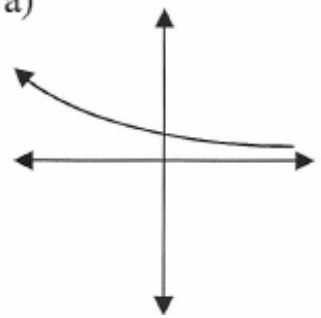


d)

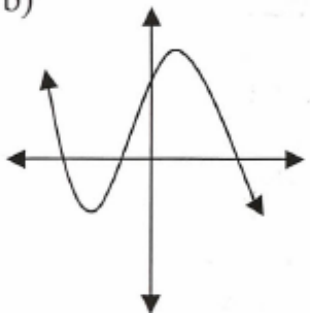


2. In which graph is the rate of change **increasing**?

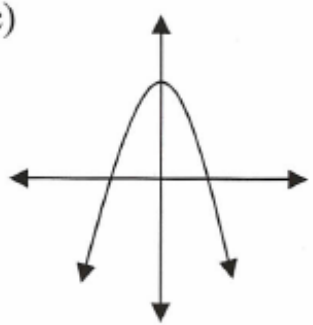
a)



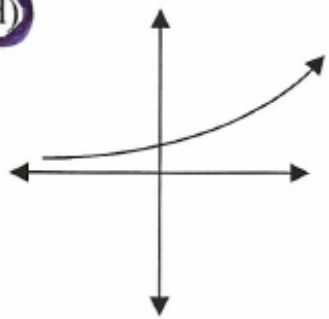
b)



c)



d)



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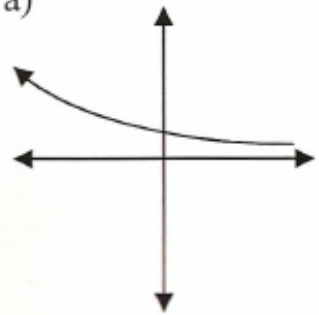
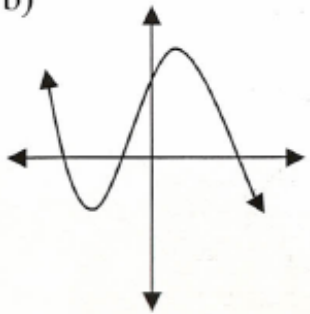
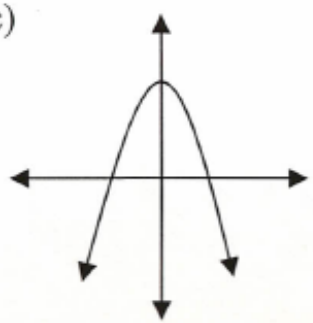
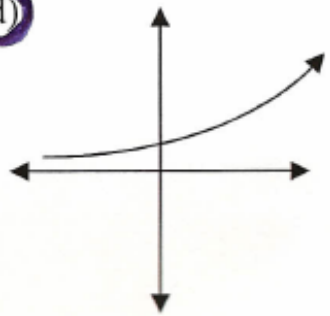
a) 

b) 

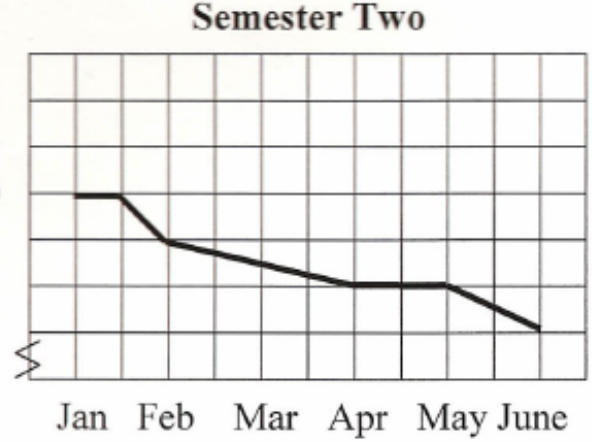
c) 

(d) 

3. The scores on tests from January until June:

a) Increased (b) Decreased

c) Remained Constant d) Do not have enough info.



4.

Seconds after start of race	0	10	20	30	40	50
Distance travelled (m)	0	50	80	120	180	250

(10,50)
(50,250)

$AROC = \frac{250-50}{50-10}$

$AROC = \frac{200}{40}$

$AROC = 5\ m/s$

The average rate of change from 10 seconds to 50 seconds was:

(a) 5 m/s b) 10 m/s c) $\frac{1}{5}$ m/s d) 40 m/s

5.

Hours	Pay
0	0
1	12
2	28
3	44
4	57

The average rate of change from 1 hour to 4 hours is:

a) \$45/h

b) \$3/h

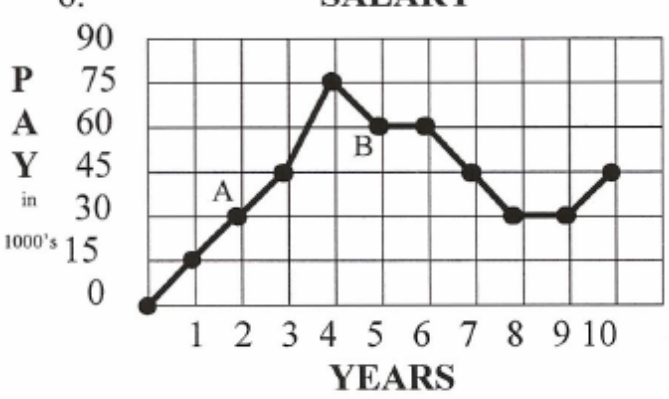
c) \$57/h

d) \$15/h

(1,12) (4,57)

$$AROC = \frac{57-12}{4-1} = \frac{45}{3} = \$15/h$$

6.



The average rate of change from interval A to B is:

a) \$10 000/year

b) -\$15 000/year

c) \$60 000/year

d) \$30 000/year

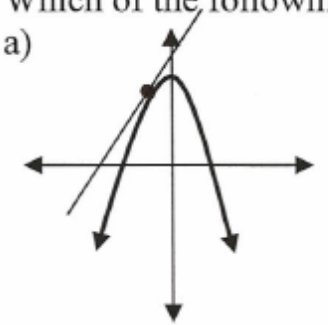
A (2,30)
B (5,60)

$$AROC = \frac{60-30}{5-2} = \frac{30}{3} = 10$$

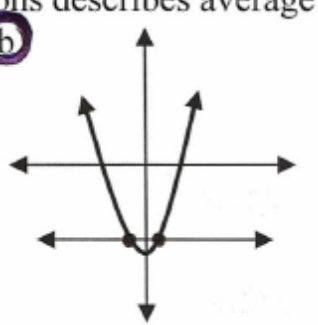
$\Rightarrow$ \$10000/year

7. Which of the following graphs describes average rate of change?

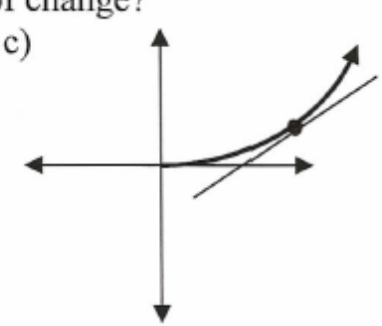
a)



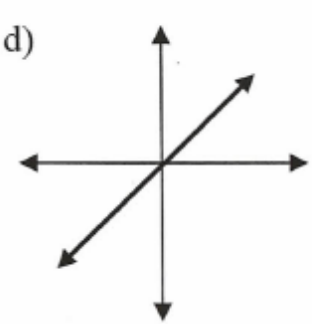
b)



c)

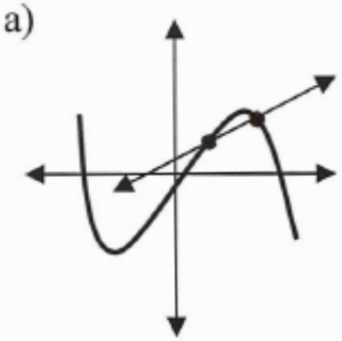


d)

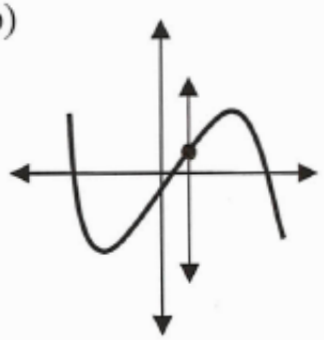


8. Which of the following graphs describes instantaneous rate of change?

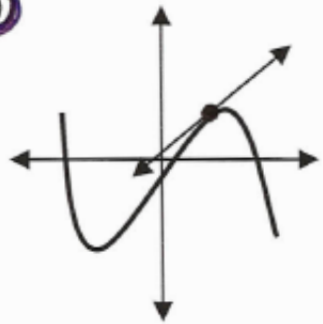
a)



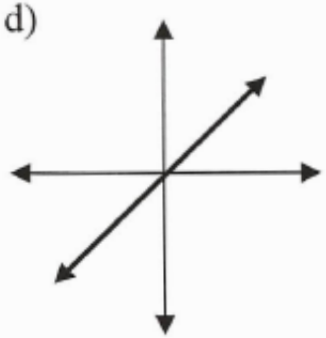
b)



c)



d)



9. The rate of change at a maximum or a minimum value is always:

a) Negative b) Zero c) Positive d) Imaginary

10. $h = -2(t-3)^2 + 4$

A) Find the average rate of change from t = 1 to t = 5.

$t=1$

$h=-2(1-3)^2+4$

$=-2(-2)^2+4$

$=-2(4)+4$

$=-8+4$

$=-4$

$(1,-4)$

$t=5$

$h=-2(5-3)^2+4$

$=-2(2)^2+4$

$=-2(4)+4$

$=-8+4$

$=-4$

$(5,-4)$

$$AROC = \frac{-4-4}{5-1} = \frac{0}{4} = 0 \text{ m/s}$$

B) Find the instantaneous rate of change at t = 2.

$t=1.9$

$h=-2(1.9-3)^2+4$

$=-2(-1.1)^2+4$

$=-2(1.21)+4$

$=-2.42+4$

$=1.58$

$(1.9, 1.58)$

$t=2.1$

$h=-2(2.1-3)^2+4$

$=-2(-0.9)^2+4$

$=-2(0.81)+4$

$=-1.62+4$

$=2.38$

$(2.1, 2.38)$

$$IROC = \frac{2.38-1.58}{2.1-1.9} = \frac{0.8}{0.2} = 4 \text{ m/s}$$

11. The following chart shows the change in temperature of a freezer when it is turned on.

Hour	Temperature	D_1	D_2
1	11	-5	-6
2	6	-11	-6
3	-5	-17	-6
4	-22	-23	
5	-45		

A) Find the average rate of change from 2 to 5 hours.

(2, 6)
(5, -45)

$AROC = \frac{-45-6}{5-2}$

$= \frac{-51}{3}$

$= -17$ degrees per hour.

* Constant on D_2 ⇓ QUADRATIC!

B) Use the table to determine the equation that best models the data.

$y = -3x^2+4x+10$

* Remember, you need to determine the type of equation first

12. $h = -4.9t^2 + 19.2t + 400$

At what time is the instantaneous rate of change equal to zero?

* Vertex

$h-400 = -4.9t^2+19.2t$

$h-400 = -4.9(t^2-3.92t)$

$h-400-18.8 = -4.9(t^2-3.92t+3.84)$

$h-418.8 = -4.9(t-1.96)^2$

$h = -4.9(t-1.96)^2+418.8$

VERTEX (1.96, 418.8)

Therefore, the instantaneous rate of change will be zero at approximately 2 seconds.